Professionalization of Exercise Physiology online

ISSN 1099-5862

February 2016
Vol 19 No 2

American Society of Exercise Physiologists
The Professional Organization of Exercise Physiologists

Do Exercise Physiologists Study Anatomy?

Tommy Boone, PhD, MPH, MAM, MBA
Board Certified Exercise Physiologist

> "Like everything new, at first people refuse to believe that new way of learning/teaching can be done, then they begin to hope that can be done, then they see that it can be done."
>
> -- *Professor Hossein Arsham*

Anatomy! Shall I say the word again ... Anatomy! Frankly, I should (and every exercise physiologist) should speak up and say out loud **ANATOMY.** Why? Anatomy is arguably one of two disciplines of study exercise physiologists must know. But, with considerable confidence, I can write in this brief article that exercise physiologists do not know much about anatomy. If they are thinking about exercise physiology, electrocardiography, biochemistry, or sports nutrition, then, they are thinking about a new research topic. Physiology topics and more research represent their areas of primary interest.

Everyone seems to know that anatomy is not just the study of the structure of the body. In fact, to fully understand anatomy is to understand human function, which is an integral foundation of physiology. Thus, a sound knowledge of anatomy prepares exercise physiologists to work in an integrated structural and functional manner with clients and patients. Sadly, though, the majority of the present-day exercise physiologists know little to nothing about anatomy. That is, to be specific, they would be hard pressed to answer the following questions: "How many muscles produce shoulder flexion?" "Which nerves are responsible for producing shoulder flexion?" "What happens to the scapular when the arm undergoes flexion?" "When certain muscles contract to produce flexion, what happens to other muscles of the shoulder joint and muscles that connect to the spinous processes?"

You may say, "Honestly, exercise physiologists do not need to know "that kind of anatomy" ... Get serious! Well, then, all I can say to such a response is ...

"Unfortunately, because you were never taught anatomy either as an undergraduate or as a doctorate student, you are unaware of what you should know." No doubt, given the academic exercise physiologists' research emphasis and the time they spend teaching basic biochemistry, they understand the importance of an appropriate cardiac output and oxygen at the tissue level and the role of the Krebs cycle in ATP production and athletic performance. Yes, I believe they understand today's message that "exercise is medicine" and are even teaching the power of exercise to treat if not prevent chronic diseases such as heart disease, hypertension, obesity, type 2 diabetes, and a host of other diseases and disabilities (both physical and mental).

What they do not seem to question is the erosion of the exercise physiology curriculum. Decades ago anatomy was considered the cornerstone in preparing students at all levels of their education. For example, when I was an undergraduate student at Northwestern State University in Natchitoches, LA in the 1960s working on a major health and physical educaiton, the kinesiology course was recognized as the applied anatomy course. We were taught and we were expected to learn the origins, insertions, and functions of the major muscles of the body. Yes, we did memorize the material, but we were also taught to visualize the anatomy of the body. Later, in the early 1970s while working on the PhD degree, I learned gross anatomy by dissecting cadavers at Florida State University in Tallahassee, FL. The cadaveric dissection for exercise physiology students was a fabulous mental and hands-on experience that opened the doors to two medical schools from which I was fortunate to secure cadavers for dissection by the exercise science students at Wake Forest University in Winston-Salem, NC and the exercise physiology students at the University of Southern Mississippi in Hattiesburg, MS and later at The College of St. Scholastica in Duluth, MN where I was Chair of the Department of Exercise Physiology.

As cadaveric dissection evolved as part of my college teaching experience, it was common to procure cadavers every year just as it was to purchase metabolic and other laboratory equipment for the exercise physiology students. Think about it. At St. Scholastica, the administration agreed with me that cadaveric dissection was necessary for the exercise physiology students to learn anatomy. Why? Answer this question, "As an exercise physiology faculty member responsible for teaching the exercise physiology course, would you expect the course to have hands-on exercise physiology laboratory experiences?" Well, obviously, 99.9% of the academic exercise is physiologists would answer ... YES! So, I ask you, why then shouldn't exercise physiology students have access to an anatomy laboratory with cadavers? If a treadmill and a metabolic analyzers are helpful, if not required to teach the cardiorespiratory dynamics of oxygen consumption at rest and during exercise, then, why wouldn't an anatomy laboratory with primates or cadavers to dissect be required

to teach the muscles that originate and insert at specific osteological sites relative to the safety of teaching resistance training exercises.

While it is logical to expect different points of view, the fact that exercise physiologists have only one view (i.e., anatomy with dissection opportunities is not necessary) makes my case rather well. Anatomy is not a valued academic course, and that is why it is not in the exercise physiology curriculum. Academic exercise physiologists have a limited exposure to anatomy by their doctorate level professors. As students, when they were in graduate school, they were not exposed to a gross anatomy course, cadaveric dissection, prosected specimens, 3D computer-aided learning or even occasional didactic anatomy lectures. That is why they cannot tell their students whether there are six or eight plantar flexors, whether some or all arise from different sides of the leg, and whether it takes one or two nerves to bring about an integrated muscle contraction.

The shortage of interest in anatomy is unnerving in itself. But, when coupled with the lack of qualified exercise physiologists who can teach gross anatomy and cadaver dissection, exercise physiology as an evolving healthcare profession is problematic. Anatomy should be an essential part of the exercise physiology curriculum in every academic institution. With it college graduates are better prepared to prescribe exercise to their clients and patients. Hence, the questions: "Are exercise physiologists interested in professional development?" When anatomy is not part of the curriculum, there is the continued assurance of less than adequate preparation of exercise physiologists as healthcare professionals. After all, anatomy is at the core of professional healthcare training in physical therapy, medicine, and similar areas of study. Why it isn't part of the exercise physiology students' education is not even being discussed. No one in exercise physiology is advocating for the inclusion of anatomy in the curriculum and certainly not cadaver dissection. Of course, there is always the one or two faculty members from different academic settings will say, "That isn't a problem for our students. Our students are taught anatomy in the Biology 101 or whatever number." Really! Get serious is all I can say. Under no circumstances whatsoever are students taught the origins, insertions, and functions of the 75 major muscles in the body in a 101 or even a 201 biology course.

While a knowledge base in anatomy was considered years ago as one of the basic pillars of exercise physiology, such thinking is no longer the case today. This understanding is a major problem if there is the collective view by other healthcare professionals that the study of anatomy is critical to the credibility of all healthcare professionals (particularly if exercise physiologists are believed to be healthcare professionals when they graduate from college). Hence, if the study of anatomy is acknowledged as important to be a competent professional, then, the same thinking must apply to exercise physiologists? Given this thinking, it would be interesting to

know exactly how many doctorate prepared exercise physiologists believe anatomy is or is not important to the success of their students as healthcare entrepreneurs in the public sector. However, without such data at hand, the fact that anatomy is not a required course among the exercise physiology doctorate level courses in the PhD curriculum is sufficient to conclude that the study of anatomy is not considered important.

Students do not even think about why anatomy is not taught. The idea of students learning to think three-dimensionally about the body is totally missing. Students are not even aware of the need to study the relationships of various structures in the body. All they know and get in terms of hands-on experiences is the measurement of oxygen consumption, blood pressure, and heart rate. Tomorrow's exercise physiologists are all about physiology! Actually, while the study of physiology is absolutely important, exercise physiologists are also responsible for the development of the musculoskeletal system. Abandoning anatomy for more biochemistry and nutrition courses has helped to ensure a generation of incompetent exercise physiologists. Yet, the inclusion of anatomy classes provides students an authoritative source of knowledge that enables them to master human structural knowledge. Indeed many students I have taught over several decades consider anatomy and dissection essential and indispensable in the study and application of exercise physiology aerobic and resistance training exercises.

If academic exercise physiologists cannot be convinced of the importance of cadaveric dissection for their students (especially at the graduate level), then they should at the very least teach the fundamental principles of anatomy to their students. Anatomy lectures along with the possibility of using plastinated models, interactive multimedia computerized learning packages, special study modules, 3D atlases of the human anatomy, surface anatomy and palpation, plastic specimens, problem-based workshops, and other learning techniques can be very helpful. It is vital to tackle this "no anatomy" problem head-on, otherwise exercise physiologists will remain under-qualified and unsafe healthcare practitioners for years to come.

Suggested Readings

1. Bay, B.H., and Ling, E.A. Teaching of Anatomy in the New Millennium. ***Singapore Medical Journal.*** 2007;48(3):182-183.
2. Bergman, E.M., Cees, P.M., et al. Why Don't They Know Enough About Anatomy: A Narrative Review. ***Medical Teacher.*** 2011;33:403-409.

3. Habbal, O. The State of Human Anatomy Teaching in the Medical Schools of Gulf Cooperation Council Countries: Present and Future Perspectives. ***SQU Medical Journal.*** 2009;9(1):24-31.
4. Shew, R.L. A Journey in Anatomy: A Road Less Traveled. ***Austin Journal of Anatomy.*** 2014;1(5):1021-1022.
5. Singh, V., and Khard, P. A Paradigm Shift from Teaching to Learning Gross Anatomy: Meta-Analysis of Implications for Instructional Methods. ***Journal of the Anatomical Society of India.*** 2013;62:84-89.
6. Sugand, K., Abrahams, P., and Khurana, A. The Anatomy of Anatomy: A Review for Its Modernization. ***Anatomical Sciences Education.*** 2010;3:83-93.